

Mason E. HALE, Jr.\*: **Six new species of *Parmelia*  
from Southeast Asia\*\***

メイスン・イー・ヘイル\*: 東南アジア産ウメノキゴケ属の6新種\*\*

(Pl. VI-VII)

During field studies for lichens in Southeast Asia by the author and Dr. S. Kurokawa under the United States—Japan Cooperative Science Program, the following six new species of *Parmelia* were discovered. Unless otherwise indicated, all specimens were collected by the author and have been deposited in the U. S. National Herbarium (US) with duplicates distributed to other herbaria as listed.

*Parmelia* subgenus *Amphigymnia* (Vain.) Dodge

Section *Amphigymnia*

1. ***Parmelia explanata*** Hale, sp. nov.

Thallus explanatus, saxicola, lobis rotundatis, ciliis, sorediis, atque isidiis destitutis, subtus niger, margine castaneus, nudus. Apothecia substipitata, disco imperfecto.

Thallus expanded, loosely attached to stone, 15–20 cm broad, ivory to mineral gray, coriaceous; lobes broad and rotund, 10–15 mm wide, the margins entire, eciliate, heavily pycnidiate on older lobes, sparsely lobulate; uppersurface plane, dull, emaculate, soredia and isidia lacking; upper cortex 15–17  $\mu$ , algal layer 16–20  $\mu$ , medulla white, 130–150  $\mu$ , lower cortex 15–18  $\mu$ ; undersurface black and sparsely rhizinate, rhizines simple, black, the marginal zone naked and brown. Apothecia common, 4–8 mm in diameter, adnate to short stipitate, amphithecium emaculate, disc imperforate; hymenium 80–90  $\mu$  high; spores 9–11  $\times$  16–18  $\mu$ , the episporium 1.5–2.0  $\mu$ .

Reactions: Thallus K+ yellow; medulla P—, K—, C+ orange red, KC+ orange, atranorine, barbatic acid, and an unknown C+ substance (by chromatography).

Type: Phu Kradung, Thailand, elev. 1200–1300 m, Syo Kurokawa 1860, Feb. 25, 1964 (TNS, holotype; US, isotype).

*Parmelia explanata* at first seems indistinguishable from *P. zollingeri* Hepp,

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but aside from having slightly smaller spores and a saxicolous habit, *P. explanata* has an unusual chemistry. No other Amphigymnia species have been clearly proven to contain barbatic acid, especially as the main component. The C+ reaction is very strong and caused by an unknown substance that usually accompanies barbatic acid in Parmelias. Chromatograms of *P. explanata* are identical with those of *P. bostrychodes* Zahlbr., *P. exsecta* Tayl., and *P. imbricatula* Zahlbr., all previously known to contain barbatic acid and the C+ unknown.

According to Kurokawa, the type locality of this conspicuous lichen is an open rocky area where saxicolous lichens, several known previously from Africa, were especially abundant. In my key to the world species (Hale 1965, p. 232), it would be separated from *P. zollingeri* by the C reaction.

Additional specimen examined. Same data as holotype, Kurokawa 1867 (TNS).  
Section Subflavescentes (Vain.) Gyl.

2. ***Parmelia planatilobata*** Hale, sp. nov.

Thallus saxicola, lobis rotundatis, margine ciliatis, superne lobulatus, lobulis dactyliformibus, subtus niger, ad ambitum castaneus, nudus.

Thallus loosely attached to rocks, 8-10 cm broad, dark mineral gray, rather fragile; lobes rotund, 8-10 mm wide, the margins entire to crenate or finely dentate, ciliate, cilia numerous, about 1 mm long; uppersurface dull to shiny, plane, emaculate, becoming densely lobulate, lobules originating laminally and marginally from papillae, becoming dactyliform, 0.2-0.4 mm wide, dorsiventral, sometimes ciliate, imbricate on older lobes; upper cortex 10-13  $\mu$ , algal layer 10-13  $\mu$ , medulla white above but often in part orange-red in lower part, 100-120  $\mu$ , lower cortex 10-12  $\mu$ ; undersurface black and rhizinate at the center, rhizines black, simple, the marginal zone naked, shiny, and brown, 2-4 mm wide. Apothecia and pycnidia unknown.

Reactions: Thallus K+ yellow; medulla K-, P-, C+ rose, KC+ red, pigmented medulla K+ purple, atranorine, gyrophoric acid, and rhodophyscin present.

Type: Mountain Garden of Tjibodas, Java, elev. about 1400 m, Syo Kurokawa 2160, March 12-13, 1964 (TNS, holotype; US, isotype).

This is the first lobulate species known in subgenus Amphigymnia and can be classified in series Emaculatae Hale (cf. Hale, 1965) (Pl. VI. Fig. 1). The lobules (Fig. 2) are unusual in the regularity of their formation and a tendency to

become closely imbricate. This species is probably related to *P. pseudocrinita* Abb., an isidiate species with identical chemistry. *Parmelia planatilobata* is now known from two localities in very similar habitats, open stones in cultivated areas at about 1400 m elevation.

Additional specimen examined. Malaya: Stonewall at Fraziers Hill, Pahang, 29702 (UPS).

Subgenus *Parmelia*

Section *Imbricaria* (Schreb.) Fr.

3. ***Parmelia subinflata*** Hale, sp. nov.

Thallus corticola, lobis sublinearibus, margine bulbociliatis, superne isidiatus, subtus pallide castaneus, rhizinis simplicibus. Apothecia ecoronata.

Thallus closely adnate on bark, dark mineral gray, 4–7 cm broad, lobes short, sublinear, 1–2 mm wide, the margins entire, ciliate, cilia bulbate but often scarcely inflated at the base; uppersurface shiny, emaculate to very weakly maculate, rugose with age, moderately isidiate, isidia simple to sparsely branched, erect, cylindrical, 0.02–0.03 mm in diameter, 0.1–0.2 mm high; upper cortex 12–14  $\mu$ , algal layer 12  $\mu$ , medulla white, 75–85  $\mu$ , lower cortex pale, 10–12  $\mu$ ; undersurface pale brown, moderately rhizinate, rhizines brown or darkening, simple. Apothecia very rare, to 1 mm in diameter, ecoronate, no mature spores seen.

Reactions: Thallus K+ yellow; medulla K—, P+ red, C—, KC+ pink, atranorine and protocetraric acid present (by G. A. o-T. and chromatography).

Type: ILCO logging area in virgin dipterocarp forest about 50 mi. south of Fabrica, near Mt. Mandalagan, Negros Occid., Philippines, Mason E. Hale 26641, July 1964 (US, holotype; TNS, UPS, isotypes).

*Parmelia subinflata* (Pl. VI, Fig. 3) belongs to subsection *Bicornutae* series *Bicornutae*, according to the classification of Hale and Kurokawa (1964). It is characterized by the pale undersurface, rather tall cylindrical isidia (Fig. 4), and protocetraric acid, being the first species in this series with this acid. The marginal bulbate cilia are variable and on the average not strongly inflated (Fig. 5). In fact, it might be possible to confuse this species with those in section *Imbricaria* subsection *Imbricaria*, which however has no species with a pale undersurface. In the key in Hale and Kurokawa (1964, p. 136), this species would key out near *P. isidiza* Nyl., an African-Asian species. *Parmelia subinflata* occurs widely at mid elevations in the Malesian region, between 300 and 1800 m, usually

growing on branches in the canopy of pines, oaks, or dipterocarps.

Additional specimens examined. Malaya: Tanah Rata, Cameron Highlands, Pahang, 29699, 29780-82; Fraziers Hill, Pahang, 29698. Philippines: Same locality as the holotype, 26576, 26655; Mountain Prov.: Virgin dipterocarp forest, PECORP logging area about 30 km south of Luna, 25771, 25790, pine forest above barrio of Mt. Data, 26378, HLC logging area about 10 km north of Mt. Data, 26115 (PUH). Sabah: Mesilau Trail, Pinosuk Plateau, Kinabalu National Park, 28199, 28563 (SAN).

4. ***Parmelia fluorescens*** Hale, sp. nov.

Thallus corticola, luteoviridis, lobis sublinearibus, margine bulbociliatis, sorediis isidiisque destitutis, subtus niger, rhizinis nigris, simplicibus vel dichotome ramosis. Apothecia ecoronata, base retrorse rhizinosa.

Thallus loosely attached to adnate on bark, deep sea foam green (Ridgway), coriaceous, 4-7 cm broad; lobes sublinear, elongate, 1-3 mm wide, the margins entire, ciliate, cilia bulbate, the base not strongly inflated; uppersurface shiny, weakly maculate, pitted and rugose with age, soredia and isidia lacking; upper cortex thick, the cells arranged in columns, 25-30  $\mu$ , algal layer 25-30  $\mu$ , medulla white, 120-150  $\mu$ , lower cortex 25  $\mu$ ; undersurface jet black, rhizinate, rhizines black, shiny, simple to dichotomously branched. Apothecia rare, adnate, 2-3 mm in diameter, usually basally retrorsely rhizinate, ecoronate; hymenium 40-50  $\mu$  high; spores 4 $\times$ 5  $\mu$ ; pycnidia not seen.

Reactions: Thallus K—; medulla K—, C—, P—, KC+ rose, usnic and alectoronic acids present (medulla fluorescing white in ultraviolet) (by G.E., G. A. W., chromatography).

Type: Between Kamaranga and the second radio tower, Tourist Trail, Kinabalu National Park, Sabah, elev. about 2200 m, Mason E. Hale 28637 (US, holotype; SAN, TNS, isotypes).

*Parmelia fluorescens* injects a previously unsuspected element of chemical variability into series Relicinae Hale & Kurok., since it contains alectoronic acid. The remaining 21 species in series Relicinae and the 28 in series Bicornutae all lack alectoronic or closely related KC+ acids (see table 1 in Hale and Kurokawa 1964), which were thought to occur only on the more advanced groups in subgenus *Parmelia*. Outside of the unusual chemistry, *P. fluorescens* is characterized by the coriaceous thallus (Pl. VII, Fig. 6) and the columnar cortex which is also found in *P. planiuscula* Kurok. Both are montane species in the Malesian

region. *Parmelia fluorescens* occurs commonly on oaks on Mt. Kinabalu at elevations between 1700 and 2200 m.

Additional specimens examined. Sabah: Kinabalu National Park: Sheltered woods below Kamaranga, 28694; woods below second radio tower, 28639, 28641; campsite on West Mesilau River, 29146 (LD); exposed ridge along West Mesilau River, 28944; along Mesilau Trail above East Mesilau River, 29232 (WIS), 28233 (DUKE, PUH, UPS).

5. ***Parmelia malesiana*** Hale, sp. nov.

Thallus corticola, luteoviridis, lobis sublinearibus, margine bulbociliatis, isidiis sorediisque destitutis, subtus niger, rhizinis nigris, simplicibus vel squarrose ramosis. Apothecia ecoronata.

Thallus adnate on bark, deep sea foam green (Ridgway), 6-8 cm broad; lobes sublinear, elongate, 1.5-2.5 mm wide, the margins entire, ciliate, the cilia bulbate, base not conspicuously inflated; uppersurface plane to rugose, faintly maculate, soredia and isidia lacking; upper cortex 12-15  $\mu$ , algal layer 12-15  $\mu$ , medulla 140-160  $\mu$ , the upper half opaque and heavily encrusted with crystals, the lower half translucent, an orange-red pigment rarely present, lower cortex dark, 19-22  $\mu$ ; undersurface dark brown or blackening, densely rhizinate, rhizines black, simple to densely squarrosely branched. Apothecia numerous, adnate, 2-3 mm in diameter, amphithecium entire to subdentate, ecoronate; hymenium 25-40  $\mu$  high; spores uniseriate, 2-4 $\times$ 3-7  $\mu$ ; pigment rarely present below the hymenium.

Reactions: Thallus K—; medulla P+ red, K—, C—, KC—, usnic and fumarprotocetraric acids present (chromatography); unidentified anthraquinone pigment (if present) K+ purple.

Type: Virgin dipterocarp forest, Nasipit Lumber Co., Florida logging area, about 30 km southeast of Butuan City, Agusan Prov., Philippines, elev. about 200 m, Mason E. Hale 25370, June 1964 (US, holotype; TNS, UPS, isotypes).

This adds another species to series Relicinae which is so common in the lowland dipterocarp forests of the Malesian region. Morphologically (Pl. VI, Fig. 7) it appears to be very close to *P. ramosissima* Kurok., a species with similar range and ecology. The undersurface of *P. malesiana*, however, is markedly darker, the marginal bulbate cilia (Fig. 8) rather inconspicuous, and the apothecia without retrorse rhizines. Incidentally *P. ramosissima* has been found to contain an unknown P+ substance, not protocetraric acid as given in Hale and Kurokawa

(1964). The only other species in series Relicinae with fumarprotocetraric acid is *P. eximbricata* (Gyel.) Hale & Kurok., a tropical American species with coronate apothecia.

*Parmelia malesiana* is confined entirely to the canopy branches of dipterocarps in the Malesian region. It is often collected with other lowland (up to 400 m) dipterocarp species such as *P. circumnodata* Nyl., *P. ramosissima* Kurok., and *P. subabstrusa* Gyel.

Additional specimens examined. Taiwan: Rengechi, Asahina F.52 (TNS). Philippines: Same data as holotype, 25206; Basilan Island: BLC logging area near Upper Canas, 24880, 24895, 24911 (DUKE, LD), 25178 (PUH). Sabah: Kennedy Bay Logging area near Mt. Silam, 29565 (SAN), 29566 (COLO, TNS), 29567, 29568.

Section Hypotrachyna Vain.

6. ***Parmelia kinabalensis*** Hale, sp. nov.

Thallus cinereo-albicans, lobis sublinearibus, margine eciliatis, sorediis isidiisque destitutis, subtus niger, rhizinis dichotome ramosis. Apothecia ecoronata.

Thallus loosely attached to branches, up to 10 cm broad, light mineral gray; lobes sublinear-elongate, 1-3 mm wide, the margins entire, eciliate; upper surface plane, shiny, very faintly maculate, more or less pitted with age, soredia and isidia lacking; upper cortex 12-16  $\mu$ , algal layer 10-12  $\mu$ , medulla white, 25-30  $\mu$ , lower cortex 12-15  $\mu$ ; undersurface jet black, densely rhizinate, rhizines black; richly dichotomously branched. Apothecia numerous, subpedicellate, 3-10 mm in diameter, amphithecium smooth; hymenium 40-50  $\mu$  high; spores 8-9 $\times$ 15-17  $\mu$ ; pycnidia present, conidia not seen.

Reactions: Thallus K+ yellow; medulla P+ light orange red, K+ deep red, C—, KC—, atranorine and norstictic acid present (G. A. o-T.).

Type: Mesilau Trail, open ridge between East and West Mesilau Rivers, Kinabalu National Park, Sabah, elev. about 1800 m, Mason E. Hale 29243, Aug. 1964 (US, holotype; LD, SAN, TNS, UPS, isotypes).

*Parmelia kinabalensis* (Pl. VII, Fig. 9) is probably the commonest *Parmelia* on Mt. Kinabalu, especially between 1600 and 2600 m, growing on small branches and trunks of oak trees in open areas along the trails. In the field it was thought to be *P. bostrychodes* Zahlbr., which contains barbatic acid and has shorter lobes and less dense rhizines. In the key to section Hypotrachyna (Hale & Kurokawa 1964, p. 163) one would come close to *P. canescens* Kurok., a tropical species also

containing norstictic acid but characterized by more irregular lobes, a more or less pruinose cortex, and small spores (8–10  $\mu$ ).

Additional specimens examined. Sabah: Kinabalu National Park: Woods below Kambaranga, 28065, 28327 (DUKE), 28697, 28740, 28757; woods above Kambaranga, 28210, 28633, 28931; Layang Layang, 29152 (PUH); Mesilau Trail just below Tourist Trail, 28019 (WIS); campsite at West Mesilau River, 28728a, 29189, 29195; ascending Mesilau Trail from West Mesilau River, 28263; same locality as holotype, 28356, 29092; forest above East Mesilau River, 28937, 29106, 29282.

### Literature Cited

Hale, M.E., 1965. A monograph of *Parmelia* subgenus *Amphigymnia*. Contr. U. S. Nat. Herb. **36**: 193–358. ———, and Kurokawa, S., 1964. Studies on *Parmelia* subgenus *Parmelia*. Ibid. **36**: 121–191.

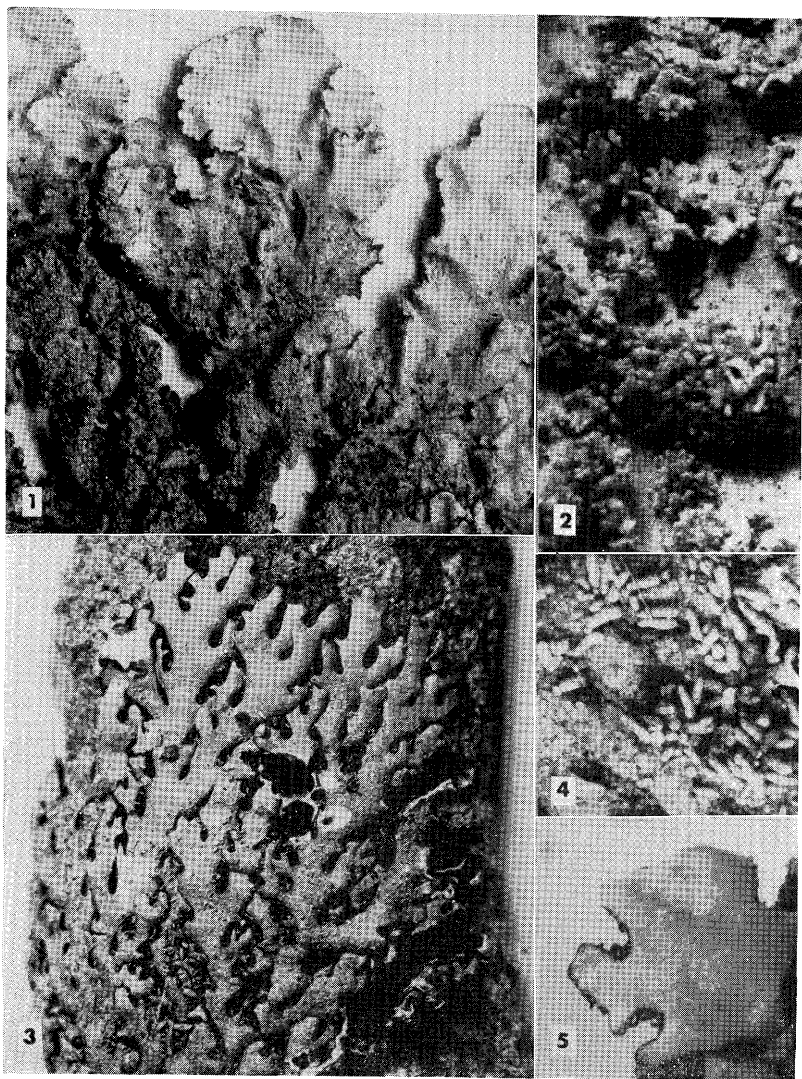
### Explanation of Plates VI–VII

Pl. VI. Fig. 1. Holotype of *Parmelia planatilobata* ( $\times 2$ ). Fig. 2. Close up of the lobules of *P. planatilobata* ( $\times 10$ ). Fig. 3. Isotype (TNS) of *P. subinflata* ( $\times 2$ ). Fig. 4. Close up of the isidia of *P. subinflata* ( $\times 10$ ). Fig. 5. Close up of the lobe tips and bulbate cilia of *P. subinflata* ( $\times 10$ ).

Pl. VII. Fig. 6. Isotype (TNS) of *P. fluorescens* ( $\times 2$ ). Fig. 7. Holotype of *P. malesiana* ( $\times 3$ ). Fig. 8. Close up of the undersurface of *P. malesiana* showing bulbate cilia ( $\times 10$ ). Fig. 9. Isotype (TNS) of *P. kinabalsensis* ( $\times 2$ ).

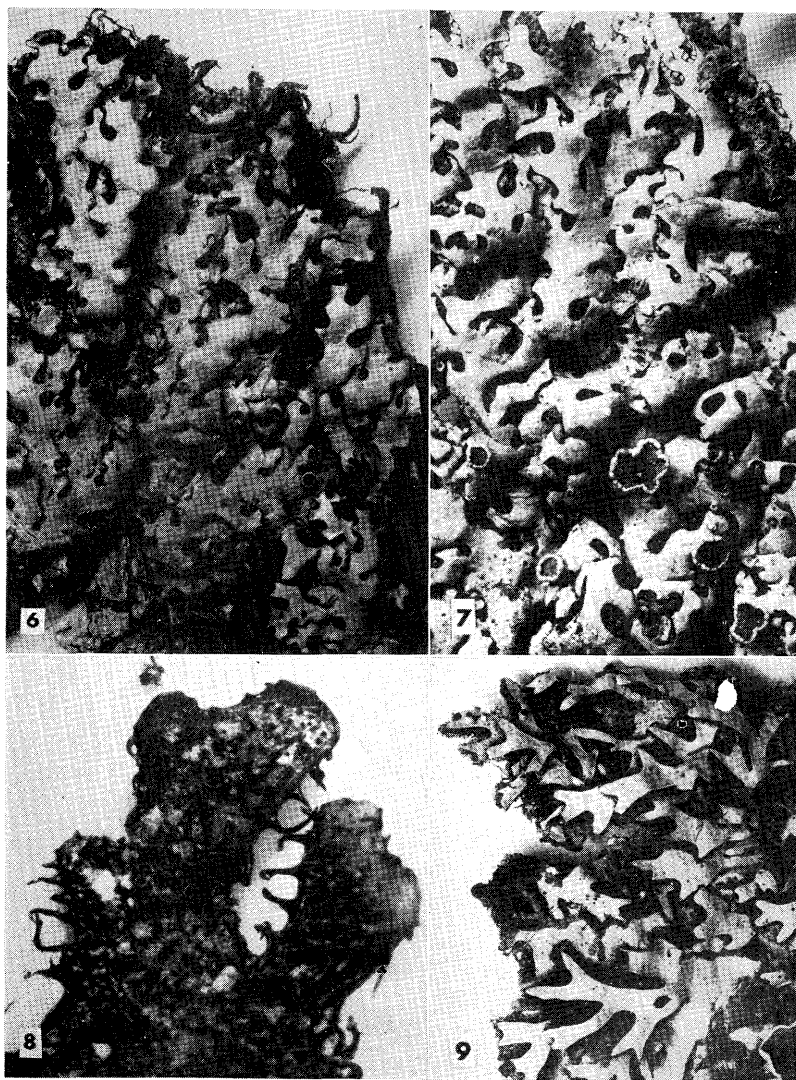
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日米科学協力のプログラムで、M. E. Hale がフィリピンとマレーシアで、黒川がジャバとタイで採集したウメノキゴケ属地衣の中から6新種が発見された。タイに分布する *P. explanata*, ジャバとマラヤに分布する *P. planatilobata* の両者は *Parmelia* 属の *Amphigymnia* 亜属に属し、マレーシアの *P. subinflata*, *P. fluorescens*, *P. malesiana* は *Parmelia* 亜属の *Section Imbricaria* に属し、又北ボルネオの神山(キナバル)で豊富な *P. kinabalsensis* は同亜属の *Section Hypotrachyna* に属する。これらのうち、*P. malesiana* は低地のラワン原始林に分布しているのに対して、その他の種はむしろ山地帯の種と考えられる。



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